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ASSIGNMENT: **Briefly discuss the CYCLIC CHANGES in any two of the following:**

**a) CERVIX** (**b) VAGINA**         (**c) BREASTS**

**Explicate any one of the following:**

**1) Menstrual cycle**

**2) Hormonal regulation of the menstrual cycle**

**ANSWER:**

**MENSTRUAL CYCLE:**

**Menstruation occurs on a monthly cycle throughout female reproductive life. Menarche (the first menstrual cycle) normally occurs between the ages of 45 and 55. The normal duration of a single cycle is 21-35 days. Bleeding usually lasts around 3-7days. The menstrual cycle is governed by hormonal changes; these changes can be altered by using hormonal birth control to prevent pregnancy.** Each cycle can be divided into three phases based on events in the ovary (ovarian cycle) or in the uterus (uterine cycle). The ovarian cycle consists of the [follicular phase](https://en.wikipedia.org/wiki/Follicular_phase), [ovulation](https://en.wikipedia.org/wiki/Ovulation), and [luteal phase](https://en.wikipedia.org/wiki/Luteal_phase) whereas the uterine cycle is divided into [menstruation](https://en.wikipedia.org/wiki/Menstruation), proliferative phase, and secretory phase.

THE OVARIAN CYCLE

Follicular phase:

The **follicular phase** marks the beginning of a new cycle as follicles (oocytes surrounded by stromal cells) begin to mature and prepare to release an oocyte.At the start of a new cycle (menses) there is little ovarian hormone production and the follicle begins to develop independently of gonadotropins or ovarian steroids. Due to the low steroid and inhibin levels, there is little**negative feedback** at the HPG axis resulting in an increase in FSH and LH levels. These stimulate follicle growth and oestrogen production.Only one dominant follicle can continue to maturity and complete each menstrual cycle. As oestrogen levels rise, negative feedback reduces FSH levels, and only one follicle can survive, with the other follicles forming **polar bodies**.

Follicular oestrogen eventually becomes high enough to initiate positive feedback at the HPG axis, increasing levels of GnRH and gonadotropins. However, the effect is only reflected in LH levels (the **LH surge**) due to the increased follicular inhibin, selectively inhibiting FSH production at the anterior pituitary. Granulosa cells become luteinised and express receptors for LH.

Ovulation:

In response to the **LH surge**, the follicle ruptures and the mature oocyte is assisted to the fallopian tube by fimbria. Here it remains viable for fertilization for around 24 hours. Following ovulation, the follicle remains luteinised, secreting oestrogen and now also **progesterone**, reverting back to negative feedback on the HPG axis. This, together with inhibin (inhibits FSH) stalls the cycle in anticipation of fertilization.

Luteal phase:

The **corpus luteum** is the tissue in the ovary that forms at the site of a ruptured follicle following ovulation. It produces estrogens, progesterone and inhibin to maintain conditions for fertilisation and implantation.At the end of the cycle, in the absence of fertilisation, the corpus luteum **spontaneously regresses** after 14 days. There is a significant fall in hormones, relieving negative feedback, resetting the HPG axis ready to begin the cycle again.

If fertilisation occurs, the syncytiotrophoblast of the embryo produces human chorionic gonadotropin **(HcG),** exerting a luteinizing effect, maintaining the corpus luteum. It is supported by placental HcG and it produces hormones to support the pregnancy. At around 4 months of gestation, the placenta is capable of production of sufficient steroid hormone to control the HPG axis.

THE UTERINE CYCLE

Menstruation;

Menstruation (also called menstrual bleeding, menses, catamenia or a period) is the first phase of the uterine cycle. The flow of menses normally serves as a sign that a woman has not become [pregnant](https://en.wikipedia.org/wiki/Pregnancy). (However, this cannot be taken as certainty, as a number of factors can cause [bleeding during pregnancy](https://en.wikipedia.org/wiki/Vaginal_bleeding#Pregnant_women); some factors are specific to [early pregnancy](https://en.wikipedia.org/wiki/First_trimester_bleeding), and some can cause heavy flow). E*umenorrhea* denotes normal, regular menstruation that lasts for a few days (usually 3 to 5 days, but anywhere from 2 to 7 days is considered normal). The average [blood loss](https://en.wikipedia.org/wiki/Bleeding) during menstruation is 35 milliliters with 10–80 ml considered normal.[]](https://en.wikipedia.org/wiki/Menstrual_cycle#cite_note-bloodloss-99) Women who experience [menorrhagia](https://en.wikipedia.org/wiki/Menorrhagia) (heavy menstrual bleeding) are more susceptible to [iron deficiency](https://en.wikipedia.org/wiki/Iron_deficiency_(medicine)) than the average person. An [enzyme](https://en.wikipedia.org/wiki/Enzyme) called [plasmin](https://en.wikipedia.org/wiki/Plasmin) inhibits [clotting](https://en.wikipedia.org/wiki/Blood_clotting) in the menstrual fluid. Painful cramping in the abdomen, back, or upper thighs is common during the first few days of menstruation. Severe uterine pain during menstruation is known as [dysmenorrhea](https://en.wikipedia.org/wiki/Dysmenorrhea), and it is most common among adolescents and younger women (affecting about 67.2% of adolescent females).When menstruation begins, symptoms of [premenstrual syndrome](https://en.wikipedia.org/wiki/Premenstrual_syndrome) (PMS) such as breast tenderness and irritability generally decrease.

Proliferative phase:

The proliferative phase is the second phase of the uterine cycle when estrogen causes the lining of the uterus to grow, or proliferate, during this time. As they mature, the ovarian follicles secrete increasing amounts of [estradiol](https://en.wikipedia.org/wiki/Estradiol), and [estrogen](https://en.wikipedia.org/wiki/Estrogen). The estrogens initiate the formation of a new layer of [endometrium](https://en.wikipedia.org/wiki/Endometrium) in the uterus, histologically identified as the proliferative endometrium. The estrogen also stimulates [crypts](https://en.wikipedia.org/wiki/Crypt_(anatomy)) in the [cervix](https://en.wikipedia.org/wiki/Cervix) to produce cervical mucus, which causes vaginal discharge regardless of arousal, and can be tracked by women practicing fertility awareness.

Secretory phase:

The secretory phase is the final phase of the uterine cycle and it corresponds to the luteal phase of the ovarian cycle. During the secretory phase, the corpus luteum produces progesterone, which plays a vital role in making the [endometrium](https://en.wikipedia.org/wiki/Endometrium) receptive to [implantation](https://en.wikipedia.org/wiki/Implantation_(human_embryo)) of the [blastocyst](https://en.wikipedia.org/wiki/Blastocyst) and supportive of the early pregnancy, by increasing blood flow and uterine secretions and reducing the contractility of the smooth muscle in the uterus; it also has the side effect of raising the woman's [basal body temperature](https://en.wikipedia.org/wiki/Basal_body_temperature).

BREAST

Breast development is a vital part of a woman’s reproduction. Breast development happens in certain stages during a woman's life: first before birth, again at puberty, and later during the childbearing years. Changes also happen to the breasts during the menstrual cycle and when a woman reaches menopause.

Each month, women go through changes in the hormones that make up the normal menstrual cycle. The hormone estrogen is produced by the ovaries in the first half of the menstrual cycle. It stimulates the growth of milk ducts in the breasts. The increasing level of estrogen leads to ovulation halfway through the cycle. Next, the hormone progesterone takes over in the second half of the cycle. It stimulates the formation of the milk glands. These hormones are believed to be responsible for the cyclical changes that many women feel in their breasts just before menstruation. These include swelling, pain, and soreness.

During menstruation, many women also have changes in breast texture. Their breasts may feel very lumpy. This is because the glands in the breast are enlarging to get ready for a possible pregnancy. If pregnancy does not happen, the breasts go back to normal size. Once menstruation starts, the cycle begins again.

VAGINA

The vagina is the passage into and out of our internal reproductive organs. Menstrual blood flows out of the vagina. Babies are also usually born through the vagina. During the menstrual cycle, an egg ripens and leaves one of the ovaries, in a process called ovaluation. Usually only one egg is released from one ovary during each menstrual cycle. While the egg is getting ready to be released, the endometrium (lining) of the uterus becomes thicker and increases the amount of blood and nutrients that comes to the uterus from other parts of the body.

The vagina also changes in response to hormonal fluctuations of the menstrual cycle. Around mid-cycle, when estrogen is highest, vaginal tissue becomes thicker and fuller.

The cervix, at the top of the vagina, moves and changes shape throughout the cycle. Before and after the fertile window, the cervix is low and can be felt in the vagina, with a firm texture, and the hole in the center of the cervix is closed. During the fertile window, the hole in the cervix opens to facilitate the entrance of sperm into the uterus; the cervix rises higher in the vagina, and is softer when touched.